JAPANESE [JP,2000-011453,A]

CLAIMS DETAILED DESCRIPTION TECHNICAL FIELD PRIOR ART EFFECT OF THE INVENTION TECHNICAL PROBLEM MEANS DESCRIPTION OF DRAWINGS DRAWINGS

[Translation done.]

* NOTICES *

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CLAIMS

[Claim(s)]
[Claim 1] A light transmission layer is formed on the information recording surface in which the information record pit was formed. From this light transmission layer side Wavelength lambda irradiates 380 nm<=lambda <=450nm laser light through a 0.76 or more N.A. (numerical aperture) lens system, read-out of the above-mentioned information is made, and it sets to a signal record section. Thickness of the above-mentioned light transmission layer is set to 3 micrometers - 182 micrometers. The thickness unevenness of the above-mentioned light transmission layer **5.26lambda/(N.A.)4 It considers as less than. The track pitch of the above-mentioned information recording surface It is referred to as 0.27 micrometers - 0.404 micrometers. The shortest pit length of the above-mentioned information record pit The optical recording medium characterized by having been referred to as 0.13 micrometers - 0.219 micrometers, having made record linear density into the 0.146micrometers [/bit] or less pit train, and setting the depth of the above-mentioned information record pit to 31nm - 75nm.
[Claim 2] The optical recording medium according to claim 1 characterized by the above-mentioned pit train consisting of an unit or two or more spirals.
[Claim 3] The optical recording medium according to claim 1 with which thickness of the above-mentioned light transmission layer is characterized by being referred to as 50 micrometers - 120 micrometers.
[Claim 4] The optical recording medium according to claim 1 with which the laminating of the above-mentioned information recording surface is carried out more than two-layer, and it changes.
[Claim 5] The optical recording medium according to claim 1 characterized by establishing a recordable field in fields other than the formation section of the above-mentioned information pit of the above-mentioned information recording surface, and changing.
[Claim 6] The optical recording medium according to claim 5 with which the above-mentioned recordable field is characterized by consisting of an unit or two or more spirals.
[Claim 7] The optical recording medium according to claim 1 characterized by for the information recording surface which has the above-mentioned information record pit, and the information recording surface which has a recordable field having carried out the laminating, and preparing it.
[Claim 8] The optical recording medium according to claim 7 characterized by arranging the above-mentioned information recording surface which has the above-mentioned pit train at the incidence side of laser light, and consisting of the information recording surface which has the above-mentioned recordable field.
[Claim 9] A light transmission layer is formed on the information recording surface in which the information record pit was formed. The thickness of this light transmission layer It is referred to as 3 micrometers - 182 micrometers, and the thickness unevenness of the above-mentioned light transmission layer is **5.26lambda/(N.A.)4. It considers as less than. The track pitch of the above-mentioned information recording surface is set to 0.27 micrometers - 0.404 micrometers. The shortest pit length of the above-mentioned information record pit is set to 0.13 micrometers - 0.219 micrometers. Record linear density is made into a 0.146micrometers [/bit] or less pit train. The depth of the above-mentioned

information record pit The optical recording medium set to 31nm - 75nm is used. Wavelength lambda 380 nm<=lambda <=450nm laser light The optical recording regenerative apparatus which is made to carry out incidence to the above-mentioned optical recording medium from the above-mentioned light transmission layer side through 0.76 or more N.A. (numerical aperture) optical system, and is characterized by reproducing recording information of the above-mentioned information recording surface.

[Claim 10] A light transmission layer is formed on an information record pit and the information recording surface which has a recordable field. Thickness of this light transmission layer is set to 3 micrometers - 182 micrometers. The thickness unevenness of the above-mentioned light transmission layer **5.26lambda/(N.A.)4 It considers as less than. The track pitch of the above-mentioned information recording surface It is referred to as 0.27 micrometers - 0.404 micrometers. The shortest pit length of the above-mentioned information record pit It is referred to as 0.13 micrometers - 0.219 micrometers, and record linear density is made into a 0.146micrometers [/bit] or less pit train. The depth of the above-mentioned information record pit uses the optical recording medium set to 31nm - 75nm. Wavelength lambda leads 0.76 or more N.A. (numerical aperture) optical system in 380 nm<=lambda <=450nm laser light. To the above-mentioned optical recording medium The optical recording regenerative apparatus which is made to carry out incidence from the above-mentioned light transmission layer side, and is characterized by the thing of playback of the recording information of the above-mentioned information recording surface, or record been made to perform either at least.

[Claim 11] A light transmission layer is formed on an information recording surface, and a laser light exposure is made from this light transmission layer side. The above-mentioned information recording surface, respectively 1st at least one or more information recording surfaces, The laminating of the 2nd information recording surface is carried out through the interlayer by the light transmission layer, respectively, and it changes. The sum of the thickness of the light transmission layer which intervenes between the plane of incidence of the above-mentioned laser light from each above-mentioned information recording surface, and an interlayer It is referred to as 3 micrometers - 182 micrometers, and the unevenness of plane of incidence and all information record face-to-face thickness is made into less than **5.26lambda/(N.A.)4. The track pitch of the information recording surface of the above 1st It is referred to as 0.27 micrometers - 0.404 micrometers. The track pitch of the information recording surface of the above 2nd It is referred to as 0.45 micrometers - 0.57 micrometers, and the information recording surface of the above 1st is received. Wavelength lambda The laser light which is 380 nm<=lambda <=450nm is irradiated through 0.76 or more N.A. (numerical aperture) optical system. Wavelength lambda to the information recording surface of the above 2nd Optical recording playback medium which irradiates the laser light which is 635 nm<=lambda <=680nm through 0.76 or more N.A. (numerical aperture) optical system, and is characterized by the thing of record or playback for which it is made at least any they are, respectively.

[Claim 12] The information recording surface of the above 1st has an information record pit. The shortest pit length of this information record pit It is referred to as 0.13 micrometers - 0.219 micrometers, and the track recording density is made into a 0.146micrometers [/bit] or less pit train. The depth of the above-mentioned information record pit is set to 31nm - 75nm. The information recording surface of the above 2nd Have an information record pit and the shortest pit length of this information record pit is set to 0.21 micrometers - 0.31 micrometers. The optical recording medium according to claim 11 characterized by having made the track recording density into the 0.21micrometers [/bit] or less pit train, and setting the depth of the above-mentioned information record pit to 57nm - 113nm.

[Claim 13] The optical recording medium according to claim 11 with which the information recording surface of the above 1st is characterized by having arranged from the information recording surface of the above 2nd to the incidence side of laser light.

[Claim 14] The optical recording medium according to claim 12 with which the information recording surface of the above 1st is characterized by having arranged from the information recording surface of the above 2nd to the incidence side of laser light.

[Claim 15] A light transmission layer is formed on an information recording surface, and a laser light

exposure is made from this light transmission layer side. The above-mentioned information recording surface, respectively 1st at least one or more information recording surfaces, The laminating of the 2nd information recording surface is carried out through the interlayer by the light transmission layer, respectively, and it changes. The sum of the thickness of the light transmission layer which intervenes between the plane of incidence of the above-mentioned laser light from each above-mentioned information recording surface, and an interlayer It is referred to as 3 micrometers - 182 micrometers, and the thickness unevenness between plane of incidence and all information recording layers is **5.26lambda/(N.A.)4. It considers as less than. The track pitch of the information recording surface of the above 1st It is referred to as 0.27 micrometers - 0.404 micrometers. The track pitch of the information recording surface of the above 2nd Wavelength lambda using the optical recording medium set to 0.45 micrometers - 0.57 micrometers 1st laser light which is 380 nm<=lambda <=450nm, Wavelength lambda 0.76 or more N.A. (numerical aperture) optical system is led in the 2nd laser light which is 635 nm<=lambda <=680nm, respectively., respectively The information recording surface of the above 1st, The optical recording regenerative apparatus which irradiates the 2nd information recording surface and is characterized by the thing of record or playback for which it performs at least any they are, respectively.

[Claim 16] The information recording surface of the above 1st has an information record pit. The shortest pit length of this information record pit It is referred to as 0.13 micrometers - 0.219 micrometers, and the track recording density is made into a 0.146micrometers [/bit] or less pit train. The depth of the above-mentioned information record pit is set to 31nm - 75nm. The information recording surface of the above 2nd Have an information record pit and the shortest pit length of this information record pit is set to 0.21 micrometers - 0.31 micrometers. The optical recording regenerative apparatus according to claim 15 characterized by using the record medium with which the track recording density was made into the 0.21micrometers [/bit] or less pit train, and the depth of the above-mentioned information record pit was set to 57nm - 113nm.

[Claim 17] The optical recording regenerative apparatus according to claim 9 with which the above-mentioned optical system is characterized by being based on 2 group lens system.

[Claim 18] The optical recording regenerative apparatus according to claim 10 with which the above-mentioned optical system is characterized by being based on 2 group lens system.

[Claim 19] The optical recording regenerative apparatus according to claim 15 with which the above-mentioned optical system is characterized by being based on 2 group lens system.

[Claim 20] The optical recording regenerative apparatus according to claim 17 characterized by considering lens spacing of 2 group lens system of the above-mentioned optical system as an adjustable configuration.

[Claim 21] The optical recording regenerative apparatus according to claim 18 characterized by considering lens spacing of 2 group lens system of the above-mentioned optical system as an adjustable configuration.

[Claim 22] The optical recording regenerative apparatus according to claim 19 characterized by considering lens spacing of 2 group lens system of the above-mentioned optical system as an adjustable configuration.

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DESCRIPTION OF DRAWINGS

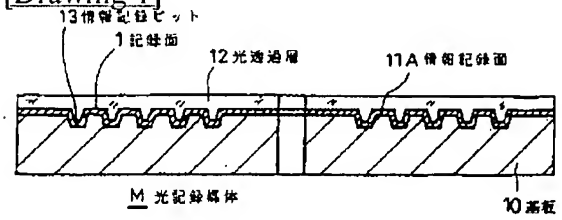
[Brief Description of the Drawings]
[Drawing 1] It is the outline sectional view of an example of the optical recording medium by this invention.
[Drawing 2] It is the outline sectional view of other examples of the optical recording medium by this invention.
[Drawing 3] It is the outline sectional view of other examples of the optical recording medium by this invention.
[Drawing 4] A and B are pattern drawings of the pit train of the example of the optical recording medium by this invention, respectively.
[Drawing 5] It is pattern drawing of the pit train of the example of the optical recording medium by this invention.
[Drawing 6] A-C is information-pattern drawing of the example of the optical recording medium by this invention, respectively.
[Drawing 7] It is the block diagram of the important section of an example of the optical recording regenerative apparatus by this invention.
[Description of Notations]
M [... The 2nd information recording surface 12 / ... A light transmission layer, 13 / ... An information record pit, 14 / ... A sheet, 15 / ... An interlayer, 31 / ... The 1st lens, 32 / ... The 2nd lens, 31a, 31b, 32a 32b / ... A lens side, 40 / ... A recordable field, P / ... Pit] ... An optical recording medium, 10 ... A base, 11A ... The 1st information recording surface, 11B

[Translation done.]

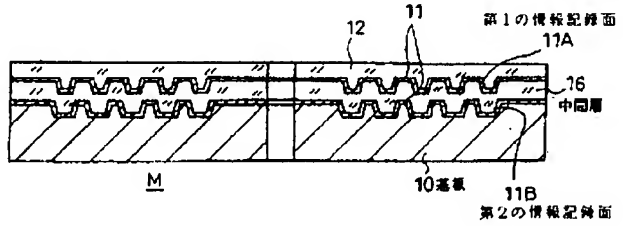
* NOTICES *

DRAWINGS

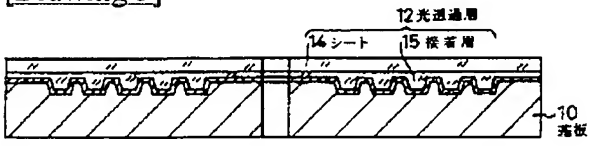
[Drawing 1]



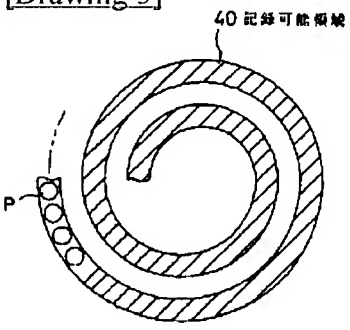
[Drawing 2]



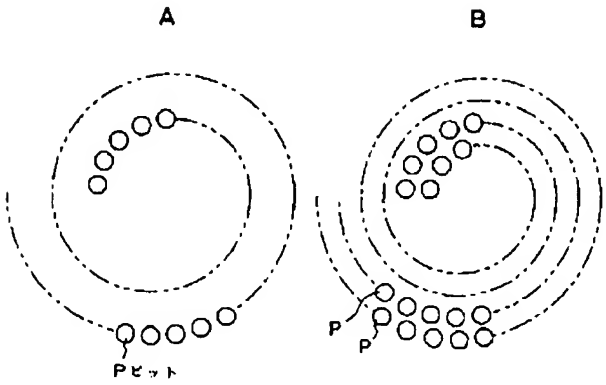
[Drawing 3]



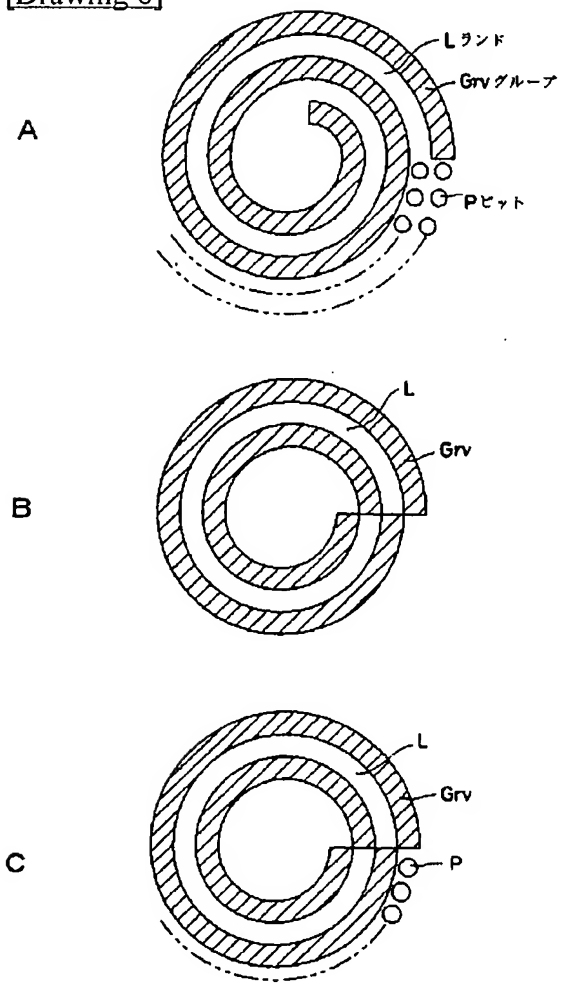
[Drawing 5]



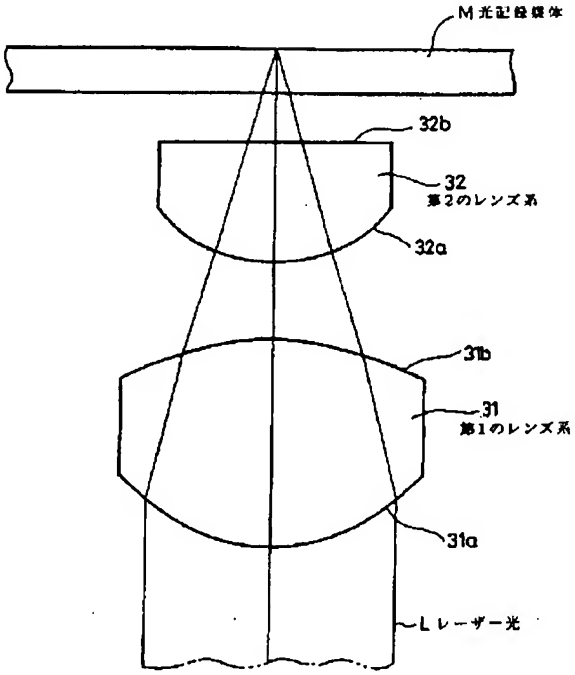
[Drawing 4]



[Drawing 6]



[Drawing 7]



[Translation done.]

Kashiwagi Toshiyuki

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This inventions are an optical recording medium, an optical recording regenerative apparatus (the optical recording regenerative apparatus in this description shall carry out the designation of the equipment which performs the playback or/and record over an optical recording medium and which is performed optically), and a thing that attains large storage capacity-ization using the wavelength range of blue, blue, and a red laser light especially.
[0002]
[Description of the Prior Art] Although the description in the case of taking a disk gestalt as an optical recording medium has the speed of access, and the advantage which can constitute a small and simple record regenerative apparatus, record playback of NTSC 4 hours is possible on one side, for example, and in order to realize the disk which changes to the present video tape recorder (VTR), the storage capacity more than 8GB (G cutting tool) is required.
[0003]
[Problem(s) to be Solved by the Invention] This invention is ROM (Read Only Memory) at least to the part which enabled it to set that storage capacity to 8GB or more. It sets it as the main object to offer the optical recording regenerative apparatus which performs the playback or/and record over the optical recording medium which considers the optical disk which has the section as a basic configuration, and this optical recording medium and which is performed optically.
[0004]
[Means for Solving the Problem] As for the optical recording medium by this invention, a light transmission layer is formed on the information recording surface in which the information record pit was formed. Wavelength lambda from this light transmission layer side 380 nm<=lambda <=450nm laser light He irradiates through a 0.76 or more N.A. (numerical aperture) lens system, and read-out of the above-mentioned information should do. Thickness of the light transmission layer is set to 3 micrometers - 182 micrometers. The thickness unevenness of a light transmission layer **5.26lambda/(N.A.)4 Consider as less than and a track pitch is set to 0.27 micrometers - 0.404 micrometers. The shortest pit length of an information record pit has the configuration which sets to 0.13 micrometers - 0.219 micrometers, makes record linear density a 0.146micrometers [/bit] or less pit train, and sets the depth of a record pit to 31nm - 75nm.
[0005] Moreover, using the optical recording medium by this invention mentioned above, wavelength lambda leads 380 nm<=lambda <=450nm laser light, N.A. leads 0.76 or more optical system, and the optical recording regenerative apparatus by this invention carries out incidence of the laser light to an optical recording medium from that light transmission layer side, and has the configuration which reproduces recording information of this information recording surface.
[0006] Moreover, a light transmission layer is formed on an information recording surface, a laser light exposure is made, the laminating of the information recording surface is carried out through the interlayer according [1st at least one or more information recording surfaces and the 2nd information

recording surface] to a light transmission layer respectively, and the optical recording medium by this invention consists of this light transmission layer side. The sum of the thickness of the light transmission layer which intervenes between the plane of incidence of laser light from each [these] information recording surface, and an interlayer is set to 3 micrometers - 182 micrometers. That is, when the thickness is set to 3 micrometers - 182 micrometers when only a light transmission layer intervenes between the plane of incidence of laser light from an information recording surface, and a light transmission layer and an interlayer intervene, the sum of such thickness is set to 3 micrometers - 182 micrometers. And it is the thickness unevenness of plane of incidence and all information storage layers **5.26lambda/(N.A.)4 It considers as less than. And the track pitch of the 1st information recording surface is set to 0.27 micrometers - 0.404 micrometers, and the track pitch of the 2nd information recording surface is set to 0.45 micrometers - 0.57 micrometers. And wavelength lambda to the 1st information recording surface The laser light which is 380 nm<=lambda <=450nm is irradiated through 0.76 or more N.A. (numerical aperture) optical system, and wavelength lambda to the 2nd information recording surface The laser light which is 635 nm<=lambda <=680nm is irradiated through 0.76 or more N.A. (numerical aperture) optical system, and is considered as the configuration of record or playback which makes either at least, respectively.

[0007] Moreover, wavelength lambda the optical recording regenerative apparatus by this invention using the optical recording medium which has the 1st and 2nd information recording surfaces mentioned above 1st laser light which is 380 nm<=lambda <=450nm, Wavelength lambda Through 0.76 or more N.A. (numerical aperture) optical system, the information recording surface of the above 1st and the 2nd information recording surface are irradiated, respectively, and 2nd laser light which is 635 nm<=lambda <=680nm is considered as the configuration of record or playback which performs at least any they are, respectively.

[0008] By considering as an above-mentioned configuration, mass storage capacity-ization of 8GB or more is enabled.

[0009]

[Embodiment of the Invention] As the gestalt of operation of one of the optical recording medium by this invention shows the outline sectional view to drawing 1 , the light transmission layer 12 is formed on information recording surface 11A by which the information record pit 13 was formed in one field of the substrate 10 by the plastic plate, the metal substrate, a glass substrate, etc.

[0010] imprinting the detailed irregularity of the necessary pattern formed in this from the stamper which formed the substrate 10 by the injection molding by the polycarbonate (PC), and has been arranged in the molding, simultaneously molding metal mold -- the -- for example -- on the other hand, the information record pit 13 mentioned above to the field -- the so-called formation of a groove is made further.

[0011] The thickness of this substrate 10 can be selected in thickness of less than 1.2mm which sets to 0.3mm or more in which injection molding is possible, and is equivalent to the thickness of the substrate in CD etc.

[0012] Thickness t of the light transmission layer 12 sets to 3 micrometers - 182 micrometers, and is the thickness unevenness deltat **5.26lambda/(N.A.)4 It considers as less than.

[0013] And incidence of the laser light which performs playback or/, and record is carried out from this light transmission layer 12 side.

[0014] Blue or the wavelength range lambda not more than this, i.e., wavelength, makes this laser light 380 nm<=lambda <=450nm laser light, and it irradiates it through a 0.76 or more N.A. (numerical aperture) lens system, for example, read-out of information, i.e., playback, is made.

[0015] Moreover, the track pitch TP of the information recording surface may be 0.27 micrometers - 0.404 micrometers. The shortest pit length Pmin of an information record pit It may be 0.13 micrometers - 0.219 micrometers. Let record linear density LD be a 0.146micrometers [/bit] or less pit train. Depth D of an information record pit may be 31nm - 75nm.

[0016] Moreover, thickness t of a light transmission layer may be 50 micrometers - 120 micrometers preferably.

[0017] Moreover, as the outline sectional view of the example is shown in drawing 2 , an information recording surface considers the optical recording medium by other gestalten by this invention as the configuration to which the laminating of at least one or more 1st information recording surface 11A and the 2nd information recording surface 11B was carried out through the interlayer 16 by the light transmission layer, respectively. When based on this configuration, the sum of the thickness of the light transmission layer which intervenes between the plane of incidence of laser light from each [these] information recording surface, and an interlayer is set to 3 micrometers - 182 micrometers. That is, for example with the configuration of drawing 2 , about 2nd information recording surface 11B, the sum of the thickness of the light transmission layer 12 and an interlayer 16 is set to 3 micrometers - 182 micrometers at the same time it sets thickness of the transparency layer 12 to 3 micrometers - 182 micrometers about 1st information recording surface 11A. And it is the thickness unevenness of plane of incidence and an information recording surface also in this case **5.26lambda/(N.A.)4 It considers as less than.

[0018] And as the configuration of above-mentioned drawing 1 explained 1st information recording surface 11A, the track pitch TP of the information recording surface sets to 0.27 micrometers - 0.404 micrometers, and is the shortest pit length Pmin of an information record pit. It is referred to as 0.13 micrometers - 0.219 micrometers, record linear density LD is made into a 0.146micrometers [/bit] or less pit train, and depth D of an information record pit is set to 31nm - 75nm.

[0019] On the other hand, the track pitch TP sets to 0.45 micrometers - 0.57 micrometers about 2nd information recording surface 11B, and it is the shortest pit length Pmin of an information record pit. It is referred to as 0.21 micrometers - 0.31 micrometers, and let record linear density LD be a 0.21micrometers [/bit] or less pit train. Moreover, depth D of an information record pit may be 57nm - 113nm.

[0020] And wavelength lambda about 1st information recording surface 11A The laser light which is 380 nm<=lambda <=450nm is irradiated through 0.76 or more N.A. (numerical aperture) optical system, and wavelength lambda about 2nd information recording surface 11B The laser light which is 635 nm<=lambda <=680nm is irradiated through 0.76 or more N.A. (numerical aperture) optical system, and is considered as the configuration of record or playback which makes either at least, respectively.

[0021] The configuration is further explained about the optical recording medium by above-mentioned this invention. First, 2nd information recording surface 11B by which playback or/, and record are made by the laser light of the wavelength range of red is explained. Already proposed DVD (Digital Versatile Disc or Digital VideoDisc) Setting, wavelength is 0.65 micrometers, numerical aperture (N.A.) is 0.6 at within the limits with a radius [out of the field of the information signal section (i.e., a core)] of 24mm - 58mm, and the storage capacity is 4.7GB. Therefore, it is from capacity (in this case, consistency) being proportional to N.A., in order to realize storage capacity of 8GB on the basis of this, and it being effective by that square in inverse proportion to wavelength. 8/4.7 = {(N.A./0.6) x (0.65/lambda)} 2 ... (1)

********** -- it is made like.

[0022] as the laser of the wavelength range of red -- the wavelength lambda -- 635nm<=lambda<=, although there is specifically 680nm (0.635 micrometers, 0.650 micrometers, and 0.680 micrometers) of laser light In the above-mentioned (1) formula if [lambda= 0.635-micrometer laser light with short wavelength will be used among these, considering high recording density-ization, and] lambda= 0.635 micrometers 8/4.7 = {(N.A./0.6) x (0.65/0.635)} 2 ... (11)

It is set to a next door and N.A.=0.76.

[0023] In these lambda= 0.635 micrometers and N.A.=0.76, and each track pitch P and the shortest pit length Pmin for attaining the storage capacity of 8GB, and linear density LD In 4.7GB of DVD 0.74 micrometers and the shortest pit length 0.40 micrometers, [a track pitch] Since linear density is 0.267micrometers/bit, a browning tone method is premised on EFM in consideration of the both sides of the direction of a line of a truck, and the cross direction. It is set to TP=0.74/root(8/4.7) =0.57micromPmin =0.40/root(8/4.7) =0.31micromLD=0.267/root(8/4.7) =0.21micrometer/bit.

[0024] And it is from the relation of a formula (11) since about N.A.=0.95 can use by considering as 2

group lens configuration as a lens system so that it may mention later. TP=0.74/(0.95/0.6x0.65/0.635)
= 0.45 micrometers Pmin =0.40/(0.95/0.6x0.65/0.635)
= 0.24 micrometers LD=0.267/(0.95/0.6x0.65/0.635)
= It becomes in bit and 0.16micrometers /, set to this invention, and it is the shortest pit length Pmin to 0.45 micrometers - 0.57 micrometers about a track pitch TP. Let record linear density LD be a 0.21micrometers [/bit] or less pit train at 0.24 micrometers - 0.31 micrometers.
[0025] Here, there is a modulation technique of an EFM (2-7) system and one to 7 system among the modulation techniques for optical disks, and the ratio of the shortest pit length:channel bit length:signal bit length of each method is 4:2:3 by 3:1:2 and 1-7 system in an EFM system. If one to 7 system is used from this relation in the case of the same consistency, pit length will decrease in number to eight ninths. The shortest pit will be set to 0.12 micrometers if this is hung.
[0026] On the other hand, when the deepest, depth D of a pit in that a modulation factor becomes max by one fourth of wavelength lambda, and the shallower one From the push pull signal in the push pull method well learned for lambda/8 as one of the servo systems of a tracking error growing into max To be these range are demanded and it is set to 680/4/1.5=113nm635/8/1.5=57nm from this about the long wave length of 680nm of the laser of the red mentioned above, and the short wavelength of 635nm. That is, in this invention, depth D of a pit may be 57nm - 113nm.
[0027] On the other hand, it compares with a red laser light, laser light (430nm for example, using the SHG (second harmonic generation) component 450nm or less of short wavelength, 400nm of semiconductor laser, and 380 morenm) is used from the laser light of short wavelength, i.e., blue, and this about information recording surface 11A, and it is [0028] in this case.
TP=0.74x (0.45/0.65x0.6/0.76)
= 0.404 micrometers Pmin =0.40x (0.45/0.65x0.6/0.76)
= 0.219 micrometers LD=0.267x (0.45/0.65x0.6/0.76)
= It becomes in bit and 0.146micrometers /.
[0029] And it is from the ability even of about N.A.=0.95 to use by considering as 2 group lens configuration as a lens system so that it may mention later. TP=0.74x (0.38/0.65x0.6/0.95)
= 0.27 micrometers Pmin =0.40x (0.38/0.65x0.6/0.95)
= 0.14 micrometers LD=0.267x (0.38/0.65x0.6/0.95)
= It becomes in bit and 0.09micrometers /, it is related with information recording surface 11A, and is the shortest pit length Pmin to 0.27 micrometers - 0.0.404 micrometers about a track pitch TP. Let record linear density LD be a 0.146micrometers [/bit] or less pit train at 0.14 micrometers - 0.219 micrometers.
[0030] Since it is set to eight ninths by 1-7 system like the above-mentioned about the shortest pit length, it is set to 0.13 micrometers.
[0031] On the other hand, since the tolerance (skew margin) SM of the inclination of the optical recording medium to the optical axis of exposure laser light has the relation between SM**lambda / (N.A.) 3 / t, when it enlarges N.A., it is necessary for the light transmission layer 12 by which the laser light which goes to the information recording surface 11 is penetrated to make the thickness t small. And about this skew margin SM, it is |SM|<=84.115 degree (lambda/(N.A.)3 / t) by JP,3-225650,A.
It is known that what is necessary is just to be in ******.
[0032] This can be applied also to the optical recording medium of this invention, and it is appropriate to this SM to consider as 0.4 degrees as concrete threshold value. It sees as how much the thickness of a light transmission layer should be now set by short-wavelength-izing of laser, and high N.A.-ization as SM=0.4 degree. If the lambda= 0.38-micrometer compatibility of the purple-blue laser of short wavelength is further taken into consideration as a laser light, supposing it will not change the conditions of ** or more [which mentioned N.A. above] in 0.76, thickness t of a light transmission layer will be set to t= 182 micrometers.
[0033] On the other hand, the minimum of the thickness of a light transmission layer is determined by whether the protection feature of a light transmission layer which also has the role from which record film and the reflective film are protected is secured. That is, if the effect of the collision with the light

transmission layer front face by access of the lens to the light transmission layer in a raise in N.A. with the dependability and 2 group lens mentioned later of an optical record medium is taken into consideration, it is required to be 3 micrometers or more. Then, thickness t of a light transmission layer is set to 3 micrometers - 182 micrometers in this invention.

[0034] Moreover, high degree of accuracy is needed also about the thickness unevenness of a light transmission layer. When the thickness of a light transmission layer shifts from the design core of a playback objective lens, the amount of aberration which the thickness unevenness gives to a laser light spot is proportional to the 4th power and wavelength lambda of N.A. Therefore, when attaining high recording density-ization by a raise in N.A., or short wavelength-ization, the thickness unevenness of a light transmission layer is restricted still more severely. In the case of CD, N.A.=0.45 are put in practical use as a concrete example of a system, and the specification of the thickness unevenness of a light transmission layer (it sets to CD and is a substrate) is **100 micrometers. Moreover, in the case of DVD, the thickness unevenness same at N.A.=0.6 is specified as **30 micrometers, respectively. If based on the permissible dose of **100 micrometers in CD, thickness unevenness deltat will become like a degree type.

<TXF FR=0007 HE=010 WI=116 LX=0500 LY=2150> deltat=**(0.45-/N.A.)4 x(lambda/0.78) x100 =**5.26x(lambda/4 (N.A.)) mum [0035] Moreover, in large-capacity-izing in an above-mentioned optical recording medium, when obtaining SM with thickness t of the light transmission layer of N.A.=0.85 comparable as the skew margin SM in now and DVD, to be less than [0.6x(0.6/0.85)3 =0.21mm] is demanded. Furthermore, when compatibility with the purple-blue laser whose wavelength is about 400nm is taken into consideration, it is set to 0.21x0.4 / 0.65= 0.129mm, and thickness t of a light transmission layer will be set to 0.12mm or less.

[0036] And although spreading of resin and adhesion of a resin sheet can be considered in order to form this light transmission layer 12 actually for example, by the method of applying resin, generating of the skew by the contraction at the time of hardening of this resin and upheaval of the outermost periphery by carrying out revolution spreading of the resin pose a problem. Then, if a resin sheet becomes thinner than 50 micrometers in this case, since a birefringence will be large and effect will arise in a signal property, as for thickness t of a light transmission layer, it is desirable [as the outline sectional view in other one gestalt is show in drawing 3 , it is consider to be an effective approach to paste up and form the resin sheet 14 of transparence by the glue line 15 of transparence but] that it is 50 micrometers or more. In addition, as for thickness t of this light transmission layer, it is desirable also from adhesion of the contaminant in a light transmission layer, the effect on the record playback laser light spot by generating of a blemish, and the instability of the servo by this that it is 50 micrometers or more.

[0037] Since it mentioned above, it will be more desirable that thickness t of a light transmission layer sets to 50 micrometers - 120 micrometers.

[0038] Furthermore, the train of the above-mentioned pit P in the optical recording medium in this invention can be considered as the configuration formed on two spiral wire in plurality and the example of a graphic display explaining the configuration of the optical recording medium by this invention, as the outline pattern drawing is shown in drawing 4 , and it considers as the configuration which is shown at drawing 4 A and which was formed on the unit, i.e., one spiral wire, or is shown at drawing 4 B.

[0039] Furthermore, as the outline pattern drawing is shown in drawing 5 , it can also consider as the configuration in which the recordable field 40 which attaches and shows a slash was established in fields other than the formation section of the information pit P of the information recording surfaces 11A and 11B. This recordable field 40 can be similarly made into an unit or two or more spirals in the pit train mentioned above.

[0040] Moreover, when considering as the configuration of plurality (two parallel spirals), for example, a double spiral etc., it can consider as the configuration of forming a spiral-like groove, and forming a recordable field in the so-called each with the land between the inside of this groove, and a groove, or forming the pit P which constitutes the ROM section to a land, for example.

[0041] The groove Grv of the shape of a spiral which attaches and shows a slash is formed so that the outline pattern drawing may be shown. furthermore, drawing 6 A -- As it considers as the configuration

which forms the pit train P, respectively on each extension of this groove Grv and the land Lnd in the meantime or is shown in drawing 6 B and C Groove Grv and Land Lnd can also consider as the configuration formed continuously, and can consider as various arrangement configurations -- it can consider as the configuration which forms the train of Pit P on the extension.

[0042] Moreover, as mentioned above, when the 1st and 2nd information recording surfaces 11A and 11B which differ in a configuration, respectively consider as the configuration by which the laminating was carried out, laminating formation can be carried out through the interlayer 16 by ultraviolet-rays hardening resin.

[0043] In this case, thickness t of a light transmission layer to 2nd information recording surface 11B becomes the sum of an interlayer 16 and the surface light transmission layer 12, as mentioned above.

[0044] And it is desirable to arrange information recording surface 11A considered more as the short wavelength response in this case to the side which approaches the incidence side of laser light, i.e., the objective lens of an optical recording regenerative apparatus, from 2nd information recording surface 11B. This is because a skew margin becomes severe more with short-wavelength-izing.

[0045] Moreover, the reflective film is formed in information recording surface 11A by the pit train according to a ROM configuration so to speak in each above-mentioned configuration. And when an information recording surface considers as the multilayer structure by which the laminating was carried out, the reflective film by the side of laser incidence presupposes that it is translucent. moreover, the record voice from which it can write in, and can consider as the so-called WO type etc. of configuration, for example, the rewriting possibility of or 1 time of the optical property by change between polycrystal-ized-amorphous changes with laser radiation in a recordable field -- when considering as the so-called phase change mold twisted like, a phase change ingredient layer is formed and it changes. Moreover, also in this recordable field, the reflective film can be formed in that forming face, i.e., a groove, and a land side if needed.

[0046] In addition, in each example mentioned above, it is not restricted to the example of a graphic display -- it can also consider as the structure which carried out the laminating of the information recording surface 11A to the multilayer, and can consider as the structure which carried out the multilayer laminating of the 1st and 2nd information recording surfaces 11A and 11B, respectively.

[0047] Moreover, the optical recording regenerative apparatus by this invention is an optical recording regenerative apparatus which performs the playback or/and record over this using each optical recording medium M, for example, the optical disk, which has the information recording surface 11A [which was mentioned above] or 1st, and 2nd information recording surfaces 11A and 11B, and changes and which is performed optically, and shows the block diagram of the important section of the example to drawing 7 . For example, to the optical recording regenerative apparatus to the optical recording medium which has only information recording surface 11A, are and it sets. It has the laser light source section (not shown) which can obtain the laser light of the wavelength lambda of the range of 380 nm<=lambda <=450nm. Incidence of this laser light L is carried out from the light transmission layer 12 side mentioned above in the direction which intersects perpendicularly to the optical recording medium M by which revolution actuation is carried out through 0.76 or more N.A. (numerical aperture) optical system, i.e., an objective lens, and playback or/and record of the recording information of that information recording surface are performed.

[0048] Moreover, the record regenerative apparatus with which the playback or/to the optical recording medium which has the 2nd information recording surface for which the 635 nm<=lambda <=680nm laser light mentioned above is used, and record are made the laser light source section (not shown) which can obtain the laser light of the wavelength lambda of the range of 380 nm<=lambda <=450nm mentioned above as similarly shown in drawing 7 -- the 1st light source section -- carrying out -- for example, this -- ** -- both Furthermore, prepare the light source section (not shown) of the 635 nm<=lambda <=680nm laser light L as the 2nd light source section, and an optical recording medium M is received. About both laser light, they are any of the 1st and 2nd information recording surfaces 11A and 11B. It considers as the configuration which carries out a change exposure by whether playback or/, and record are performed to an information recording surface.

[0049] And as optical system of each above-mentioned optical recording regenerative apparatus, 2 group lens systems 31 and 32 can constitute, and high N.A. can be obtained by doing in this way. The single lens which has lens side 31a which has a necessary curved surface, respectively, and 31b, 32a and 32b not only constitutes these lens systems 31 and 32, but it can form it as a lens group with two or more lenses, respectively.

[0050] Moreover, 2 group lens systems 32 and 33 in this optical system can be considered as the configuration make possible adjustable [of the modification adjustment of mutual spacing of]. Thus, by considering as an adjustable configuration, the wave aberration produced when the thickness of a light transmission layer changes can be negated, and the simplification of a design and manufacture, the stabilization of record playback, and the improvement in a property in an optical recording medium and an optical recording regenerative apparatus can be aimed at by this.

[0051] As mentioned above, according to this invention, the optical recording equipment which performs the optical recording medium which can enable mass record of 8GB, for example, its playback or/, and record can be constituted, limiting the skew margin to extent in DVD.

[0052] In addition, although it is the case where one or more layers of information recording surfaces are formed in one field of a substrate 10, in the optical recording medium mentioned above Thus, by sticking two substrates 10 with which the information recording surface was formed, respectively in an opposite hand with the side in which each information recording surface was formed, can also form the optical recording medium of a double-sided mold, and it sets to the optical recording regenerative apparatus according to this. An optical recording medium and an optical recording regenerative apparatus according "Don't consider as the configuration which irradiates laser light to the information recording surface of these both sides, respectively" to this invention can make various deformation change.

[0053] In addition, in this description, it is needless to say in transparence and light transmission, and the designation of what has permeability to the laser light used is carried out.

[0054]

[Effect of the Invention] The optical recording equipment which performs the optical recording medium which can enable mass record of 8GB, for example, its playback or/, and record can be constituted limiting the skew margin to extent in DVD in the optical recording medium which performs playback or/, and record according to this invention, as mentioned above.

[Translation done.]